

Hospital developing powerful record system

By Elizabeth Gardner

Query: Why would a major multispecialty clinic ask a nuclear weapons laboratory for help in automating its medical records?

Response: Because the weapons lab has a supercomputer powerful enough to read a million outpatient charts word for word in an hour and a half. And it's looking for projects to keep the machine busy.

Scott and White Memorial Hospital in Temple, Texas, has contracted with Los Alamos (N.M.) National Laboratory's computer applications group to develop a prototype electronic medical record system for the Scott and White Clinic, a 300-physician multispecialty group practice that has 750,000 patient visits a year.

Dual-purpose system. The goal is to produce an electronic medical record that's as useful for patient care as the traditional paper chart and also can be used to analyze medical information for research and policymaking.

The prototype will be developed on Apple Computer's Macintosh personal computers, which use symbols to help computer novices navigate the system like a pro after only a few hours of training. The Los Alamos supercomputer, a Connection Machine Model CM-2 from Thinking Machines, Cambridge, Mass., will analyze the data contained in the records.

Dennis Myers, M.D., one of two Scott and White physicians working on the project, hopes to create an electronic record that preserves the intuitive accessibility of paper charts. Most electronic record systems have failed because they require too much change in a physician's behavior, he said.

"Paper medical records don't follow a nice orderly structure that's easy to analyze," he said. "Physicians get angry when you try to impose an orderly structure," such as requiring them to fit a diagnosis or an operative report into a pre-defined length. "Some diagnoses need one line and others need five pages. A surgeon may dictate part of his report and then draw a picture of what he did."

Physicians need equal flexibility when they read a record, Dr. Myers said. "You forget how long it takes a physician to learn how to read paper records. There are all kinds of extra clues—dog-eared pages, markers, different colored forms—that are part of the message." Those clues are lost in most automated record systems, and there's been no adequate substitute

for them, he said.

The Macintosh, like many powerful small computers, can accommodate text, pictures, graphs and voice recordings. Color monitors can duplicate the look of paper records, and a large screen will let physicians look at many different pieces of information simultaneously, Dr. Myers said.

Scott and White's computerized record ideally would impose no limitations on a physician's ability to put information in or get it out. But the less structure a computerized record has, the more difficult it is to analyze. That's a problem, because

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the ability to analyze medical information is a major incentive for computerizing medical records. That's where the supercomputer comes in.

Brute force. "The Connection Machine is a brute-force approach," said Lee Ankeny, one of two Los Alamos researchers working on the project. The machine uses "massively parallel processing," which means thousands of processors are working at once.

The CM-2 has 65,000 processors, each one the equivalent of a tiny computer. With special programming to tell the machine how to divide up the work, it can accomplish in seconds a task that might take hours or even days on a standard mainframe. (Mainframes in commercial use may have only two or three processors, though each one handles more information at a time than

those in the CM-2.)

Mr. Ankeny likens the process to building a house, where the work is divided between bricklayers, carpenters, plumbers, electricians and other types of workers. Dr. Myers suggests the analogy of a supermarket with 10 checkout lines instead of one.

"Connection Machines are useful for correlating large numbers of records and comparing dissimilar pieces of information," Mr. Ankeny said. A less powerful computer might be programmed to look for key words in certain places in the medical record—for example, finding all records that contain a certain diagnosis code or certain words in the "history" section of the patient's record. In contrast, the Connection Machine can be programmed to "read" entire records and find many pieces of information simultaneously, no matter where they are in the record.

Connection Machines are priced between \$300,000 and \$10 million depending on their configuration, said a spokesman for Thinking Machines. Scott and White will use the analytic abilities of the computer at Los Alamos rather than buying one of its own.

Dr. Myers estimated that the initial prototype will be completed by the end of this year at a cost of about \$150,000. The first working system, for a handful of physicians, could cost about \$500,000. He estimated it would cost more than \$50 million to install such a system throughout the Scott and White Clinic, but it might be worth it. The clinic spends millions of dollars annually and employs 100 people to handle its paper records. "We have between 98% and 99% record availability, but it costs us through the nose," he said.

Humans may lack speed, but computers lack skill



Even in the age of computers, most word-for-word medical record review is still done by human beings. At a reading speed of 300 words per minute, a human being can read a 100-page medical record (300 words or two kilobytes per page), in about one hour and 40 minutes. In computer terms, human "throughput" is 0.03 Kb/second.

The "massively parallel" supercomputer being used by Scott and White

Memorial Hospital and Los Alamos National Laboratory can read more than 100 megabytes of data, or 50,000 pages, per second.

It can read 500 records per second, or 3 million records in one hour and 40 minutes.

Of course, now comes the task of teaching the computer how to "skim," how to ignore irrelevant sections and how to interpret ambiguous physicians' notes.

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